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leafy to the top; the leaves all narrowly linear from a broad base, 3-6 cm. long, about 5 mm. wide, the upper shorter, equaling or surpassing the inflorescence, appressed pubescent on both surfaces, the midrib prominent; flowers many in close clusters on ascending peduncles, the pedicels hirsute pubescent, the calyx 3-3.5 mm. long, divided to very near the base, the lobes narrowly linear, glabrous except the ciliate margins, the corolla about 10 mm. long, the tube and limb about equal in length.

Mertensia media belongs to the Lanceolatae, and, following Dr. Rydberg's Key in the Flora of Colorado, its characters lead to *M. lateriflora* Greene or *M. amoena* A. Nelson; but it is quite a different plant, noticeably in the pubescence. *M. lateriflora* has "the whole plant canescently silky-strigose," and *M. amoena* is much the same. It is a taller plant than *M. amoena*, the leaves are longer and more pointed, the calyx lobes are narrower and less ciliate. In general appearance it closely resembles *M. lanceolata* (Pursh) DC. Collected at Palmer Lake, El Paso County, Colorado, May 24, 1913; no. 4882.

WINDSOR, COLO.

SOME EFFECTS OF EXCESSIVE HEAT IN NORTHERN MICHIGAN*

BY HENRY ALLAN GLEASON

During the last week of July, 1917, a heat wave of unprecedented intensity spread over the region of the Great Lakes. At numerous stations of the Weather Bureau temperatures in excess of 100° F. were recorded. At the biological station of the University of Michigan, located seventeen miles south of the Straits of Mackinac, all previous records for high temperatures were passed. On July 29, the temperature was above 90° for over nine hours, and reached a maximum of 101°. The following day a maximum of 93° was recorded. On July 31, the temperature was above 100° for over five hours, with a maximum of 104°, and above 90° for eleven hours. During these same days the minimum was also unusually high, remaining above 80° for three and a half days continuously.

* Paper No. 166 from the Botanical Laboratory of the University of Michigan.

On both July 29 and 31, the high temperature was accompanied by cloudless skies and a continuous south wind which sometimes reached the velocity of a gale. The relative humidity was very low, probably reaching 30 per cent., although measurements were not taken. Under such circumstances no general inconvenience was felt and the skin did not become moist from sensible perspiration.

In thickets, where the air was not in rapid circulation, even more extreme temperatures were noted. At a height of four feet in the shade of aspen thickets, the temperature rose $2\frac{1}{2}$ degrees higher, to $106\frac{1}{2}^{\circ}$. At the level of the herbaceous layer beneath the thickets, the temperature was 109° , that of the ground debris 107° , and that of the soil two inches deep 85° . In the sun in the aspen thickets, the temperature at four feet was 108° , under the shade of the ground cover of *Pteris aquilina* 112° , at the level of the layer of *Vaccinium pennsylvanicum* 116° , in the ground debris 125° , and in the soil at a depth of two inches 101° . The surface temperature of bare soil with no protective cover reached 140° .

Such conditions are obviously extreme for the boreal flora of northern Michigan, and some of their effects became visible at once. Leaflets of *Rhus glabra* wilted, hung vertically downward, and did not fully recover until three days later. Leaves of *Acer rubrum* became harsh and stiff, bent into irregular position, and exposed the whitened lower surface so freely that the color was visible at a distance of a quarter of a mile.

In other cases, the effects were not noticed until the following day or later. Leaves of *Gaultheria procumbens*, *Mitchella repens*, and *Chimaphila umbellata*, when growing in the sun, were in many cases killed. Two days later they were brown in color and extremely brittle. Plants of *Mitchella repens* and *Clintonia borealis*, which had grown in the shade and had been exposed to the wind by a partial clearing of the surrounding vegetation, showed leaves which were wholly or partly desiccated, even though they had not been directly in the sun. Leaves of *Antennaria neo-dioica*, which ordinarily grows in the full sun, became permanently rolled into a half cylinder, exposing the whitened

lower surface. Many sun leaves of *Rubus allegheniensis* developed sunburn spots in the center of each leaflet. Ripe fruits of *Vaccinium pennsylvanicum* partially dried on the plant. Leaves of *Diervilla lonicera* growing in the full sunshine developed sunburn to a marked extent. In fact, only a few plants escaped and so thoroughly was the color developed that patches of *Diervilla* on hillsides became visible at a long distance.

All of these effects may be referred to the unusually high transpiration, caused by high temperatures, wind, and low humidity, and furthered by the low water content of the sandy soil, on which no rain had fallen in ten days.

To obtain some idea of the reduction in leaf temperature caused by transpiration, the crude experiment of wrapping a leaf around the bulb of a thermometer was used. A single thickness of the leaf, with the lower surface exposed, was held around the bulb with a pair of forceps, and the temperature noted after 30 seconds exposure. Leaves of *Acer rubrum* produced no depression of temperature at all, and also showed greater evidence of immediate injury than any other plants on which the experiment was tried. *Populus tremuloides* caused a depression of one to two degrees, while *Populus grandidentata*, known to transpire at a more rapid rate, produced two to four degrees depression. *Gaultheria procumbens*, surrounded by an air temperature as high as 112° when the experiment was tried, produced an average depression of over four degrees.

THE PECK TESTIMONIAL EXHIBIT OF MUSHROOM MODELS

BY HOMER D. HOUSE

It is peculiarly fitting at this time to describe rather briefly the exhibit of mushroom models, recently installed in the State Museum at Albany, N. Y., as a memorial to the life and services of the late Charles Horton Peck, state botanist of New York from 1867 to 1915, a period of forty-eight years, all except the last two years having been spent in active service.